Endocrine−disrupting Compounds, Personal Care and Pharmaceutical Products as Potential Stressors to CALFED Target Species and Challenges to Integrated Water Management

Geoffrey S Siemering

Public Comments

No public comments were received for this proposal.

Technical Synthesis Panel Review

Proposal Title

#0157: Endocrine−disrupting Compounds, Personal Care and Pharmaceutical Products as Potential Stressors to CALFED Target Species and Challenges to Integrated Water Management

Final Panel Rating
adequate

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

The proposal is strong in its goals and justification for the overall project. Various chemicals of this group do occur in fish, and are getting increasing attention. But we do not know how common these are in the Delta and whether or not they have an effect on fish and wildlife. The proposal is also strong in its collaboration between various investigators that are experts in their field. But the proposal is not fully developed and thought trough. It is unclear how a list of concentrations of the EDCs and PPCPs measured in water and fish will be tied to observations on vitellogenin levels and histopathological changes? Especially since there are likely to be other water quality differences among the sites (that are apparently not being measured). And the fish species chosen do not occur throughout the Delta. Also indicative of the lack of development is that the two first tasks of the project are to develop a list of EDCs and PPCPs to be measured and to develop the sampling strategy (and site selection) – one normally expects this to be done as part of the proposal preparation.The proposal is not a very polished product (e.g. many editorial mistakes), which one of the external reviewers found worrisome with respect to the quality control for this large study.

Additional Comments:

The external reviewers felt that the goals and objectives were gnerally clear,and that the idea was timely and important. Goal 1 (to determine concentrations of the chemicals)was felt to be a logical first step; goals 2 and 3 were found to be broader in scope and in need of refining to more specific, testable hypotheses. Justification for the project was felt to be generally very strong. The general approach was valid, but the detailed approach should have been thought out prior to submission of the proposal. For example, the long list of chemicals should have been narrowed down at this point. The project was felt to be technically feasible. Some details that were questioned were the fish sampling with respect to VTG analyses. Will the fish be dead when they arrive at UC riverside, so caudal amputation may not yield a blood sample at this stage? It was felt that products of value would be produced. The chemical inventory of pollutants would be useful; the limited histology/biomarker data may be less useful. The proposal seems to have been hastily put together, with editorial mistakes etc. Coordination among the large members of the team would be a challenge. The budget was felt to be high for the proposed scope of the work, and in some cases not appropriate (e.g. $500/sample for VTG analyses was felt to be outrageous). Overall evaluations ranged from GOOD (2x), to EXCELLENT. It was generally felt that the proposal started out strong (with respect to goals etc.), but then fell apart as the details were unclear and the connections between the different components not worked out very well.

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histopathological changes? Especially since there are likely to be other water quality differences among the sites (that are apparently not being measured). And the fish species chosen do not occur throughout the Delta. Also indicative of the lack of development is that the two first tasks of the project are to develop a list of EDCs and PPCPs to be measured and to develop the sampling strategy (and site selection) – one normally expects this to be done as part of the proposal preparation.The proposal is not a very polished product (e.g. many editorial mistakes), which one of the external reviewers found worrisome with respect to the quality control for this large study.

Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

Endocrine−disrupting compounds, personal care and pharmaceutical products as potential stressors to CALFED target species and challenges to integrated water management

External Reviews were good to excellent. Primary and secondary reviewers rated as adequate. Proposal was strong in its goals and justification, and in collaboration design. Integration with ongoing monitoring studies was good. Panel feels it is important to know how compounds would potentially affect species of concern in the delta. Panel expressed concerns regarding lack of focused work with regard to identifying specific compounds to examine that would be most applicable to an understanding of the relevance for the delta. Proposal was unclear on how measurement of compounds will be tied to effects. The sampling program was not clearly identified and developed. Budget was considered by panel to be very expensive. Some concern expressed regarding coordination of team participants. Study design basically too broad, without tractable focus on specific compounds.

Final Ranking: Adequate

Technical Review #1

proposal title: Endocrine−disrupting Compounds, Personal Care and Pharmaceutical Products as Potential Stressors to CALFED Target Species and Challenges to Integrated Water Management

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals and objectives are clearly stated and consistent throughout the proposal. The idea is very timely and important as the wide−spread presence of EDC &PPCP contaminants could significantly undermine ecosystem restoration goals. It is vitally important to determine the extent, persistence, and biological significance of these contaminants in the Bay−Delta System.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**This proposed study is excellently justified in the proposal with an extensive, concise, focused literature review. The conceptual model is clearly stated and identified in the proposal and demonstrates the clear line of logic this team has used to formulate its study. This work is clearly justified given the state of our knowledge and the serious threat that these contaminants can have on CALFED target species.**

Rating	**excellent**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The approach is well designed and appropriate for meeting the goals and objectives of the study. The analytical approaches are state−of−the art; the spatially segmented sampling design is elegant (and allows identification of distinct delta regions); the fish tissue sampling and histological bio−marker approach allows determination of the biological affects of EDC &PPCP contamination; the modeling places the bio−marker results into a population context. I was mildly disappointed that they did not elaborate on the fish tissue and modeling approaches. The two fish species they identified (carp or largemouth bass) are not distributed throughout the entire bay−delta system (due to salinity and temperature affects), thus other resident species will need to be included in their fish tissue sampling and analysis.**
Rating	**very good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The approach is fully documented (contaminant identification, sampling, analytical procedures,**

	bio−marker establishment, modeling) and feasible (all approaches have been applied successfully before). Consequently, the likelihood of success is high. The scale of the project, though large, is within the capability of this very experienced team.
Rating	excellent

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	Not Applicable
Rating	not applicable

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	The products of this study are high value. Even if EDC &PPCP’s are shown to be at non−toxic levels it establishes a base line for future studies. The contribution of this study to the overall restoration goals of the CALFED program are considered by the authors and they make a strong case for their relevance.
Rating	excellent

Additional Comments

Comments	I find this proposal very well thought out and well presented. It will lead to important information about the presence of potentially significant environmental stressors that can limit the effectiveness of planned restoration efforts. The various tasks in the proposal

	were well integrated and the products important. I was mildly annoyed by the relatively large number of editorial mistakes in the proposal; it makes one wonder if their QA/QC programs are capable of ensuring the quality of data coming out of this ambitious, complicated, and rather enormous study.

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The overall track record of the authors is impressive (measured by their academic achievements and publication records). The project team is most certainly qualified to implement the project they have proposed. I am mildly concerned that their Principal Investigator (Geoffrey Siemering) is not experienced enough to handle a project of this magnitude and complexity; he is manager of the Aquatic Pesticide Monitoring Program (which is larger) but gives the reviewer no indication of how successful this program is and whether he can handle yet another assignment that appears to run concurrently. The team has all the available infrastructure and technical support to accomplish the project.**
Rating	**very good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The budget seems reasonable and adequate for the work proposed. These types of analytical processes are inherently expensive and the team does an excellent job of utilizing opportunities to control costs. The idea of shifting funds when savings are achieved (e.g., refined analyte lists for bioaccumulation, cost sharing with CVRWQCB, teaming with other monitoring**

	programs) indicates that they intend to leverage these funds to obtain as much information as possible regarding EDC &PPCP contamination.
Rating	**very good**

Overall

Provide a brief explanation of your summary rating.

Comments	**Given the importance of this work and the significant contribution it can make to the CALFED restoration program I rate this proposal as excellent. The study design is solid, well planned, and can be accomplished within the budget proposed. The analytical procedures are well identified and utilize experienced laboratories capable of handling the volume of samples planned. The fish tissue analysis and bio−marker identification bridge the gap from concentration to biological impact. The model allows the impacts at the individual level to be placed into a population context. This should allow CALFED to evaluate the environmental risk of EDC's and PPCP's to restoration actions for target species.**
Rating	**excellent**

Technical Review #2

proposal title: Endocrine−disrupting Compounds, Personal Care and Pharmaceutical Products as Potential Stressors to CALFED Target Species and Challenges to Integrated Water Management

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**Are the goals, objectives and hypotheses clearly stated and internally consistent? Yes, the goals are clearly stated and are consistent throughout the proposal.** **Is the idea timely and important? This is extremely timely given the recent studies showing high levels of pharmaceuticals in various watersheds. It is critical to assess the spatial and time variations in levels of these chemicals on a watershed−wide basis.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**Is the study justified relative to existing knowledge? Yes, this study is justified given the recent CALFED pilot study showing PBDEs in fish tissues.** **Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the**

	proposed work? The conceptual model is clearly stated, but not very well thought out. It appears that much of the work proposed for tasks 1 and 2 should have already been thought out prior to submission of this proposal. For example, at least a preliminary sampling transect should have been proposed, with room for change after consulting other scientists in the area. (See approach, below). **Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified? It is not clear whether this will be a pilot, demonstration, or full−scale implementation project.**
Rating	**good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**Is the approach well designed and appropriate for meeting the objectives of the project? No. The approach is not even designed at this point: 1) there is no design for a sampling transect; 2) a very long and general list of chemicals to be assessed should have been narrowed down by now; and 3) the biomarker endpoints are questionable.** **1) Although there should always be room to adjust sampling transects, there should have been some attempt to either use an existing transect, or at least choose stations that have already been in use for other studies. Having a series of long meetings (at a cost of over $175,000!) to discuss where to sample is not appropriate.**

	2) Although it appears that there have not yet been detailed pilot studies to assess contaminant levels in the watershed, some best−guesses should have been made as to contaminants of importance. Table 1 is just a long rendition of chemicals, and this list should have been more thought out, given either biological importance of likelihood of appearance in the watershed given surrounding land−use−patterns.
Rating	**good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**Is the approach fully documented and technically feasible? Absolutely. The collaborators on this proposal are all experts in their fields, and the methods are well documented and feasible. The only concern is that the fish sampling for VTG is not clearly spelled out. It appears that fish will be sampled by electroshocking and will be sent to UC Riverside for analysis. Will the fish be dead? If not, how will they be kept alive? Will handling stress affect the biomarker outcome? If the fish are dead, how can a caudal amputation yield blood samples? These may seem like minor details, but points to the overall lack of thought that went into this proposal.** **What is the likelihood of success? Very high.** **Is the scale of the project consistent with the objectives and within the grasp of authors? Yes, the scale is consistent and the objectives are within the grasp of the authors.**
Rating	

	very good

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? The proposal states that it will investigate 20 stations—10 low exposure and 10 high exposure. It would be better to have 6−7 low; 6−7 medium and 6−7 high exposure areas to give an idea of the gradient of responses.** **Are there plans to interpret monitoring data or otherwise develop information? Yes.**
Rating	**good**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**Are products of value likely from the project? Products include a chemical inventory of pollutants in the watershed, which would be useful. Less useful would be the limited histology/biomarker data.** **Are contributions to larger data management systems relevant and considered? Yes, there will be quite a bit of data−sharing and interactions with other scientists.** **Are interpretive (or interpretable) outcomes likely from the project? It is possible that interpretive outcomes may come from this project, although it**

	appears that most of the data will be correlation, not causation.
Rating	**very good**

Additional Comments

Comments	**This proposal seems to have been hastily put together from a series of copy/pasting exercises, leaving hanging sentences, poor grammar, and generally a disjointed proposal. Given a bit more effort and time to explain some of the shortcomings, this could have been a solid proposal.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**What is the track record of authors in terms of past performance? The lead PI is less experienced than his collaborators. The lead−collaborators are all experts in their fields and will be a valuable asset. It also appears that a number of the collaborators have worked together in the past. However, it was totally unclear in reading the body of the proposal as to who would do what. Not until the task list did it become apparent who would do what, and even then the qualifications of personnel to perform various tasks were left to the imagination, or to be found only after poring over detailed CVs.** **Is the project team qualified to efficiently and effectively implement the proposed project? Yes** **Do they have available the infrastructure and other aspects of support necessary to accomplish the project? Yes**
Rating	

	very good

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	Is the budget reasonable and adequate for the work proposed? The budget is not appropriate. $500/sample to analyze VTG levels in blood plasma is outrageous. A 480−well ELISA kit costs ~ $1500−2000, and will be enough to run 100 samples in triplicate, or even in quadruplicate. Incidentals should be in the range of a few $1000 at best, and part−time technician time (it would take no more than one week to run these 100 samples on an ELISA) cannot possibly add up to $50,000. In addition, deciding where to sample should cost considerably less than $177,000+ (task 1 cost).
Rating	fair

Overall

Provide a brief explanation of your summary rating.

Comments	Provide a brief explanation of your summary rating. This proposal starts out with an excellent goal that would be highly useful for decision makers. However, the proposal quickly falls apart as the details are un−clear, and there seems to have been little thought put into the proposal. Overall, this is a good start, but needs quite a bit more thought to be feasible.
Rating	good

Technical Review #3

proposal title: Endocrine−disrupting Compounds, Personal Care and Pharmaceutical Products as Potential Stressors to CALFED Target Species and Challenges to Integrated Water Management

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals of this study were to (1) systematically determine concentrations of endocrine disrupting compounds (EDCs) and pharmaceutical and personal care products (PPCPs) in the Sacramento/San Joaquin Delta, (2) determine their effects on resident fish populations and (3) model their potential for impact on fish populations. As there is increasing evidence of both widespread occurrence and potential toxicity for EDCs and (especially) PPCPs, the overall goal of this project is timely and important. Objective (1) is the logical first step in assessing risk for this "new generation" of organic contaminants, however, objectives (2) and (3) are broader in scope and are in need of refining to more specific, testable hypotheses.**
Rating	**good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The authors present a lucid, comprehensive and convincing argument for doing this work using current, peer−reviewed literature sources to support their case. This is particularly true for chemical surveys of emerging contaminants in natural waters such as the Delta to see what is potentially relevant and what is not. The arguments become more controversial, as is typical, when attempting to link effects in individual organisms and populations to contaminants in situ. The authors to their credit give concrete examples where certain contaminants (e.g. PBDEs) have increased in fish over recent years which justifies the next level of research. Their selection of target analytes (Table 1) is backed by frequency of detection information. The "conceptual model" for this project is based on the use of fish biomarkers as proxies for contaminant exposure and/or effects (using a previously developed health index model, correlative and principal components analyses).**
Rating	**very good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**This multi−investigator field study will be managed by a dedicated Project Manager. The first step is development of a target analyte list out of a shopping list of chemicals of varied origin/use. This task will be performed by literature searching and through the opinions of experts, however, a more definitive and region specific approach would have been a field exercise where Delta samples could be surveyed for Table 1 analytes and perhaps more. This in my opinion would result in a much more relevant and perhaps streamlined final target list. The next step is a sampling design exercise to select 60 sites using a**

	combination stratified random and probabilistic sampling design (a bit confusing). Certain segments or reaches of the Delta would be selected by "experts" and sampled randomly in Year 1 during the summer where water depth permitted. Here again, a pilot sampling during the wet and dry season might be in order to verify assumptions that the dry season is "worst case" (are PCPPs only used during the summer?). Critical water collection details such as collection depth, composite or grab and water quality criteria like minimum salinity were not given. In Year 2, water and fish (for biomarkers) are to be collected from 10 "highly impacted" and 10 "non−impacted" sites. It was not clear whether a range (for correlative analyses) or closely grouped sites in terms of contaminants were the final site selection criteria or whether effects thresholds were expected. Two labs would analyze water and fish tissue for several contaminants classes using well described methods. Why PAH are included for fish is a mystery since they are known to be metabolized. Plasma vitellogenin (UCR) and histopathology (UCD) of selected fish organs will be conducted on carp or bass. Methods are well described and based on peer−reviewed published protocols. **Contaminant and biomarker data will be modeled using an existing (AUSUM) program which creates a health index based on biomarker response. Indices will then be integrated with chemical measurements using principal components analysis to determine if health and contaminant−specific groups can be separated.** **The results of the Year 1 and 2 chemical surveys will no doubt be relevant and informative to end users. However, whether biomarkers are related with contaminants or not is somewhat moot if comprehensive water quality data are also not available for each selected site.**
Rating	**fair**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**Water and fish collection, and contaminant and biomarker analyses were well described demonstrating a high probability of success for each of these individual measurements. As in most large ecotoxicological studies, optimism abounds when relying on biomarkers to "determine" effects due to contaminants. These work fine in the lab, but there was little discussion on what other field conditions (temperature, salinity, DO) might play a significant role in explaining biomarker fluctuations. Thus, I am not as optimistic as the authors of the likelihood of achieving goals (2) and (3).**
Rating	**good**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**The initial survey of 60 sites for Year 1 is streamlined into 20 sites during Year 2. These date will be valuable in designing future monitoring programs for EDCs and PPCPs in the region.**
Rating	**very good**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**Project output will be presented at annual CALFED conferences, and disseminated through**

	multiple end user entities (e.g. Public Health, Water Quality, Ecosystem Restoration) associated with CALFED. Although the authors envision project results will influence the Delta Ecosystem Restoration Plan, they do not state how or in what capacity this will occur. With end users involved as co−PIs on the project, dissemination efforts will likely be maximized.
Rating	**very good**

Additional Comments

Comments	**The proposal was well written and organized, but heavy on boiler plate in some instances. For example, a paragraph (Work Plan Task 1) devoted to QAPPs gave no (important) details on what kinds of QA provisions were to be implemented. The balance between project management and science, thus, was at if not slightly over the edge. Key references (Snyder 2003, 2005) were incorrectly cited or not included in the bibliography.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The project team is very large (16−members) presenting a coordination challenge for any lead PI. However, since the lead PI's main expertise (and duties on this project) are coordination and document writing, this should not be a problem. PIs Snyder and Schlenk have excellent publication records and are a plus to the project. Carrying 2 analytical labs due to a "heavy work load" (100 samples per year?) is less than compelling and brings into question interlaboratory quality issues and cost−effectiveness. It would seem more productive for each lab to concentrate on specific analyte classes as proficiency in EDC or PPCP**

	analyses in either analytical lab was not evident in CVs (none included for AXYS PI). The team is also heavy on consultants, including a SWRCB employee, whose roles are somewhat questionable in light of the large budget (> $1M).
Rating	**good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The total requested budget ($1.19M) is high for the proposed scope of work. The same amount could be used to expand the scope and reduce portions for project management, study design, consultants, documentation efforts and associated ancillary staff. Such an expanded scope could include collection and analysis of additional samples using a more refined approach with more preliminary sampling and analyses (see also Approach).**
Rating	**fair**

Overall

Provide a brief explanation of your summary rating.

Comments	**This project will measure EDCs and PPCPs in the Delta region, data that are sorely needed to examine potential for impacts as the authors competently justify. The overall study design could use improvement but analytical methods are well described and cutting edge. Certain aspects of the project could be re−thought to better meet project goals, which are increasingly nebulous, broad and thus of questionable attainability (can this study really determine the effects of EDCs and PPCPs?). The proposal was well written but the budget appears high for the project**

	scope, probably due to the extremely large number (16) of participants. For these reasons, I grade this proposal as GOOD.
Rating	**good**